volume has now appeared.[6] The twenty-five species illustrated include six new species of Crataegus from Missouri, and new species from China or Japan under Ulmus, Berberis, and Viburnum (3). Four new species of Lonicera from China are described without illustration by REHDER, who also describes and illustrates a new hybrid under Malus. The tropical American (Florida and Mexico to Central America) species illustrated are *Alvaradoa amorphoides* Liebm., *Pinus Greggii* Engelm., and *P. Lumholtzii* Robinson and Fernald. The ten remaining species are from China or Japan, and belong to Berberis, Acer, Rhododendron, Viburnum (5), and Lonicera (2).—J. M. C.

Plant phyla.—Professor BESSEY[7] has been working for many years upon a natural (evolutionary) classification of plants, and the result has just appeared in published form. He recognizes fifteen great "phyla," and presents a diagram to illustrate their relationship. It is impossible to give any adequate conception of the scheme, for it is very compactly presented and includes an enormous mass of details. A glimpse of the point of view may be obtained from the following list of the "phyla," the number following each name indicating the number of families included: Myxophyceae (9), Protophyceae (17), Zygophyceae (21), Siphonophyceae (18), Phaeophyceae (23), Carpophyceae (26), Carpomyceteae (145), Bryophyta (54), Pteridophyta (13), Calamophyta (4), Lepidophyta (7), Cycadophyta (9), Gnetales (1), Strobilophyta (9), Anthophyta (280). The labor involved in organizing and defining these 636 families must have been enormous.—J. M. C.

American Breeders' Association.—The literature of breeding which is now growing with great rapidity is necessarily much scattered. The third annual report of the American Breeders' Association[8] contains a large number of papers covering a wide range of subjects relating to both plant and animal breeding. The papers which are of most interest to scientific breeders and students of heredity are "Inheritance in pedigree breeding of poultry" and "Recent advances in the theory of breeding," by C. B. DAVENPORT; "The production and fixation of new breeds," by W. E. CASTLE; "Some results in selecting red clover for disease resistance," by S. M. BAIN; "Heredity in carnation seedlings," by J. B. NORTON; "Report of the committee on theoretic research in heredity," by CHARLES W. WARD; "The chromosome in the transmission of hereditary characters," by W. J. SPILLMAN. There are also a number of excellent papers and reports which must be of the greatest value to breeders of the economic crops. One of the best of these

[6] SARGENT, C. S., Trees and shrubs. Illustrations of new or little known ligneous plants, prepared chiefly from material at the Arnold Arboretum of Harvard University. Vol. II. Part I. pp. 1–55. *pls. 101–125.* Boston and New York: Houghton, Mifflin & Company. 1907. $5.00.

[7] BESSEY, CHARLES E., A synopsis of plant phyla. Univ. Nebraska Studies 7:no. 4. pp. 100. 1907. Lincoln: University Publishing Company. 50 cents.

[8] Annual report of the American Breeders' Association, Vol. 3. 8vo. pp. 305. Washington, D. C. 1907.

is a scheme for corn breeding worked out in very clear detail by C. G. WILLIAMS, by which it is hoped to secure the greatest possible improvement without encountering the injurious effects of inbreeding. In the rapid development of all breeding problems, due to the universal interest which is being taken both in scientific and economic aspects of the subject, the annual reports of the American Breeders' Association must continue to be a most valuable source of information as to the present state of knowledge, and no one who is interested in these problems from either point of view can afford to be without the annual volumes.—GEORGE H. SHULL.

NOTES FOR STUDENTS

Ascent of water.—EWART becomes a stronger and stronger opponent of the DIXON-JOLY theory of the ascent of sap, and in his last paper[9] adduces some powerful arguments, backed by observations, against it and in favor of the theory of vital maintenance of suitable conditions for conduction and some sort of pumping action. The latter may be by surface tension, but while theoretical ways abound in which this might be applied, no practical proof of the existence of any such action in wood is forthcoming. EWART'S experiments all tend to show, he thinks, that the continuous ascent of water is possible only in living wood, and that the power of conduction is rapidly lost at death. Experiments on the suction and exudation of trees at different levels showed no continuous water columns or high internal tensions in the tracheae during active transpiration, and this fact, coupled with the high total resistance to flow, indicates that this resistance is overcome locally from point to point, and not by enormous tension from above, which leads to blocking by gas bubbles, nor by pressure from below, which leads to great loss by lateral exudation from the vessels.

EWART makes several corrections of his own and others' previous observations. He finds no vessels open the whole length of the tree, as STRASBURGER thought to be the case in oak. Wistaria furnished him the longest—5.64^{m}. In the oak they are seldom over 1^{m}. Nor does EWART sustain STRASBURGER'S results on the conduction of water through dead wood, for if these experiments are sound, vital action is out of the question. His own earlier observations on the osmotic pressures in leaves at different levels are also disowned, for he now finds as great differences in leaves at the same level. Incidentally he looked up the evidence as to the height of the tallest trees in Australia, and concludes that none appreciably exceed 300 feet, instead of being 472 as reported. He thinks that the height of some of our American big trees may likewise shrink on investigation.

In the course of the discussion of exudation he makes the very good point that fully turgid cells, for example, those of the root cortex, may act simply as a membrane between the water in the vessels and the outside water, their own osmotic pressure, however high, having no influence on the transfer of water from soil to vessel so long as they remain fully turgid. This also explains how cells of unlike

[9] EWART, A. J., The ascent of water in trees (second paper). Phil. Trans. Roy. Soc. London B **199**:341–392. 1908.